CNS - Don’t Forget the Ground!

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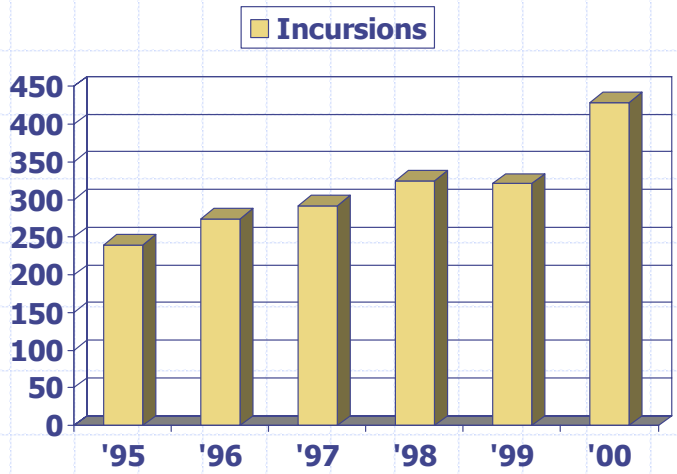
Problem

- Projections (US - next ten years):
  - 35% increase in commercial airline flights
  - 21% increase in general aviation (GA) flights
  - Approx. five new runways
- Runway incursions are on the rise
- Primary causes?
  - Increased traffic density
  - Pressure to maintain schedule
  - Loss of situational awareness
  - More accurate reporting
- Future? - SATS



Source: FAA Runway Safety Website

Causal Factors

- Pilot Deviations
  - Pilot communications (when, where, length/complexity of, confirmation of taxi instructions (36%)
  - Unfamiliarity with airports (18%)
  - Proper use of "Alerting Aids" to focus pilot attention to critical situations (when needed) (15%)
- Operational Errors
  - Communications - Most significant area at issue **(25%)**
  - Surface Operations Procedures **(22%)**
  - Surface incident risk major concern for controllers **(22%)**
- Vehicle Deviations
  - **60%** solvable: Construction, Airline maintenance, security emergency
  - Remaining **40%** involve civilian vehicles

Breadth of the problem

- Large (towered), medium (scheduled towered), small (non-towered) airports
- Airport capacity (throughput): operations per hour
- Complexity of runway/taxiway configurations
- Large (747), medium(Citation), small aircraft (Piper), vehicles (inspection, construction, emergency)
- Equipage: cockpit, vehicle, tower, airport surface

Solution Space

- Education of pilots, controllers, and vehicle operators
- Improved signage, lighting and pavement markings
- Improved procedures: e.g., standard taxi routes
- Technology - focus of this talk
  - To date, attention has been on large airports
    - ASDE (34), ASDE-X (25+) = 59/384 (towered airports)
    - Need to address medium to small airports
  - Reaction time is key - a system that warns pilots at the same time that it warns controllers is preferred
  - Mixed equipage is always an issue
  - Controller, pilot, operator acceptance is always an issue

Technologies Under Evaluation

- Inductive Loop technology - (FAA) 1996
- Advanced Taxiway Guidance System (FAA) 1998
- Runway Status Lights (FAA) 1997, 2001
- Radio Frequency Identification System (FAA) 1998
- Vehicle tracking system (FAA/NASA) 1999
- Cockpit moving map display (FAA/NASA) 1998
- Traffic Information System Broadcast (TIS-B) 2000

Technologies Under Evaluation

- Infrared sensors 1996, 2001
- Intelligent systems
- Pulsed Precision Approach Path Indicator (PAPI)
- Addressable runway/taxi signs
- Tower controller augmented reality goggle system
- Hold line laser lighting
- Acoustic sensors 1997, 2001
- Runway Warning Alert System (RWAS)
- Beacon marker

Cockpit Surface Moving Map Technology

Phase 1

- Basic surface moving map

Phase 2

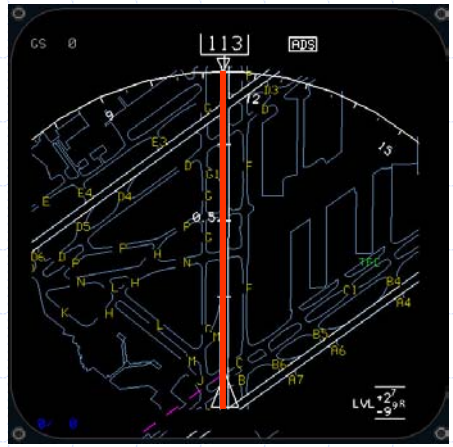
- Phase 1
- Target reports (requires ADS-B / TIS-B)

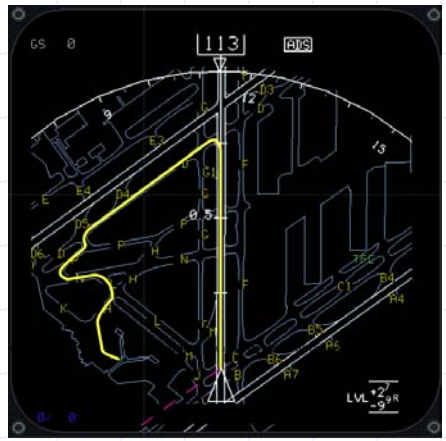
Phase 3

- Phase 1 and 2
- Alerting (requires common alerting scheme with ATC

Phase 4

- Phase 1, 2 and 3
- Data link of taxi instructions (requires CDPLC in CY05)





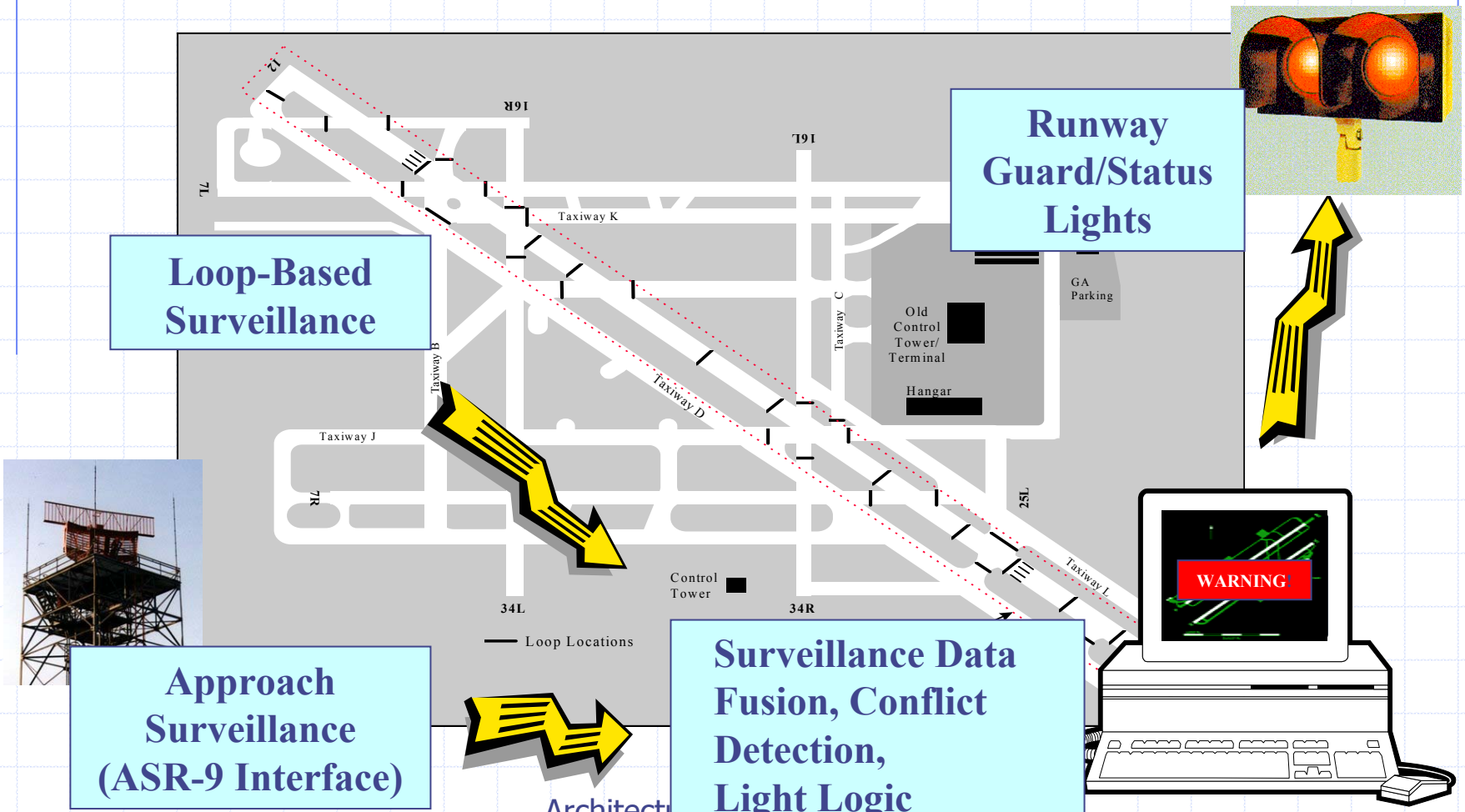
Typical ADS-B, TIS-B Avionics

Approx. $30,000

Until then…recommendation

- Develop "fast track" programs
  - Runway Status Lights using w/ ASDE, ASDE-X
    - Completed "hooded" evaluation
    - Pilot notification approach
  - Low-cost Runway Safety System - Inductive Loops
    - Runway Encapsulation
    - "Hot Spots"
    - Blind spot monitoring
    - Taxi route conformance
    - Runway Status Light
- Evaluate other selected technologies

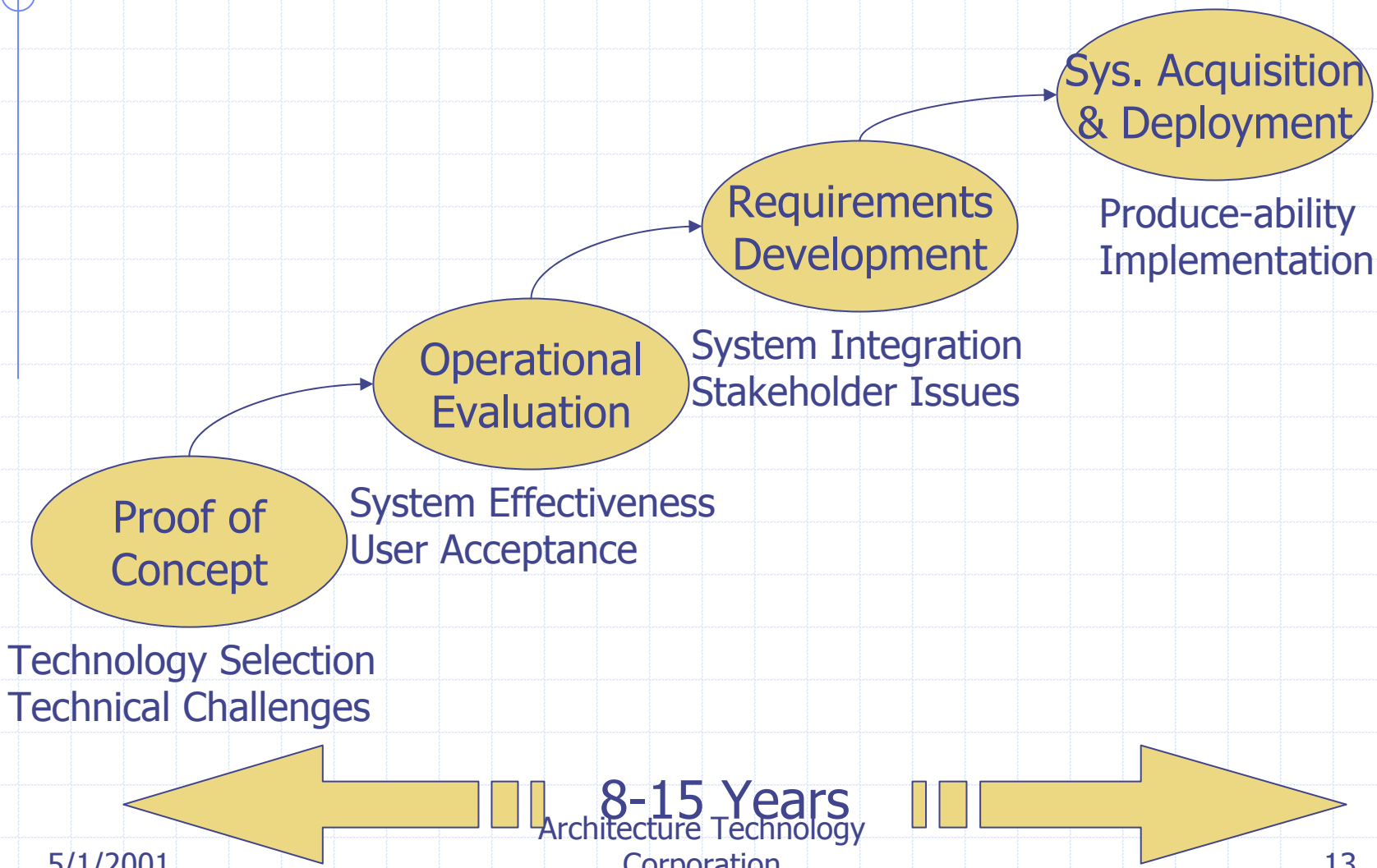
Low-cost Runway Safety System Based on Inductive Loops/Lights



Impediments to progress

- Lack of process - R&D to certified operational system
- Diversity of the environment
- Headline chasing
- Large number of stakeholders: FAA(s), NASA, RTCA, NTSB, NATCA, PASS, Airports, AAAE, Airlines, ATA, ALPA, AOPA, DoD, Avionics Mfg., ICAO, Congress
- Complexity and contradiction among stakeholder requirements
- Consensus decision making approach - adversarial "Gotcha" attitude

R&D to Operational System



Conclusion

- Remember the “phase of flight” spent on the ground
- Develop a “fast track” R&D to operational system process
- Mixed equipage is ALWAYS a problem
- Solicit inputs, but make decisions

One at a time - please!